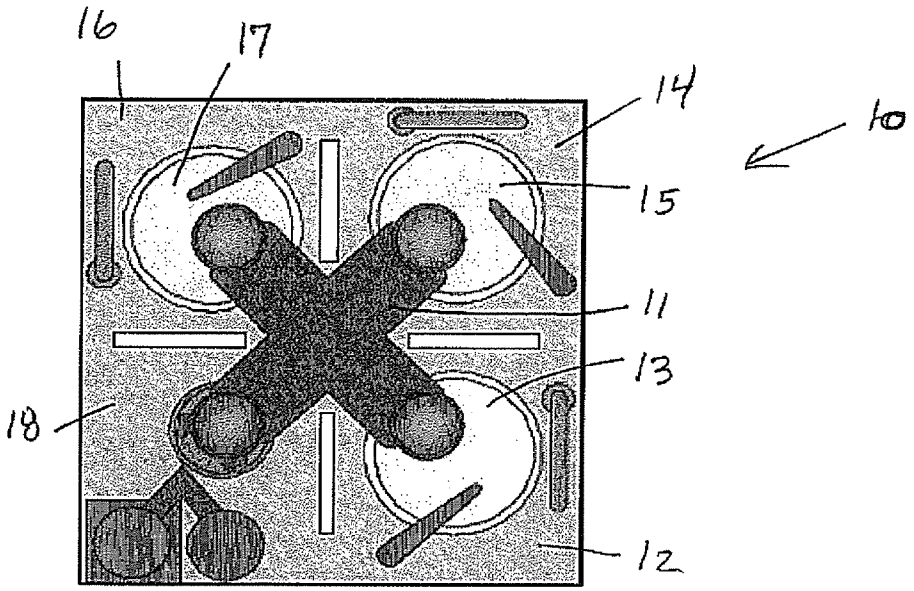


FIG._1A
(PRIOR ART)

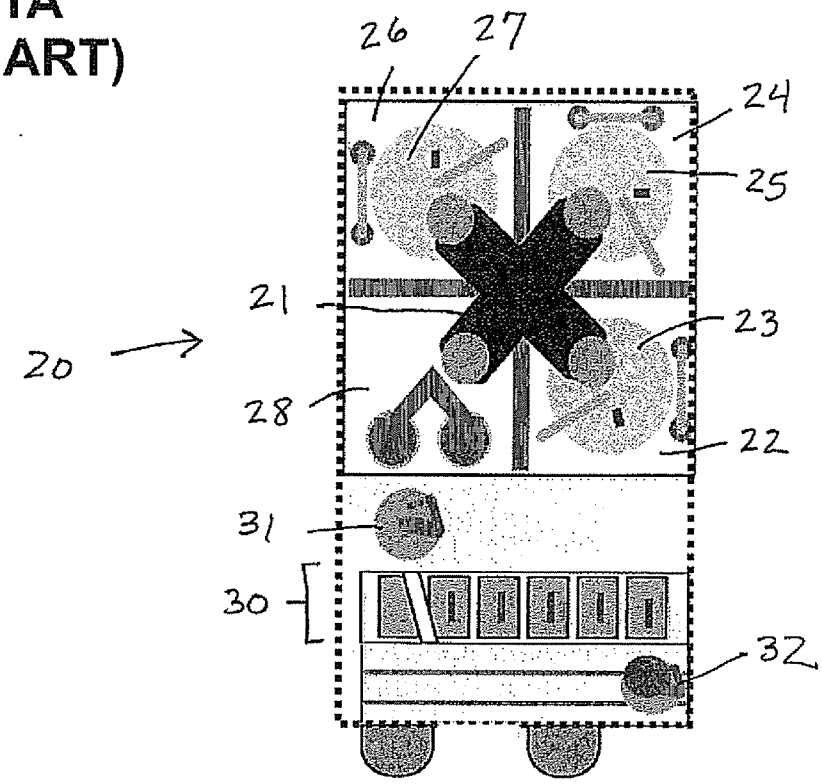


FIG._1B
(PRIOR ART)

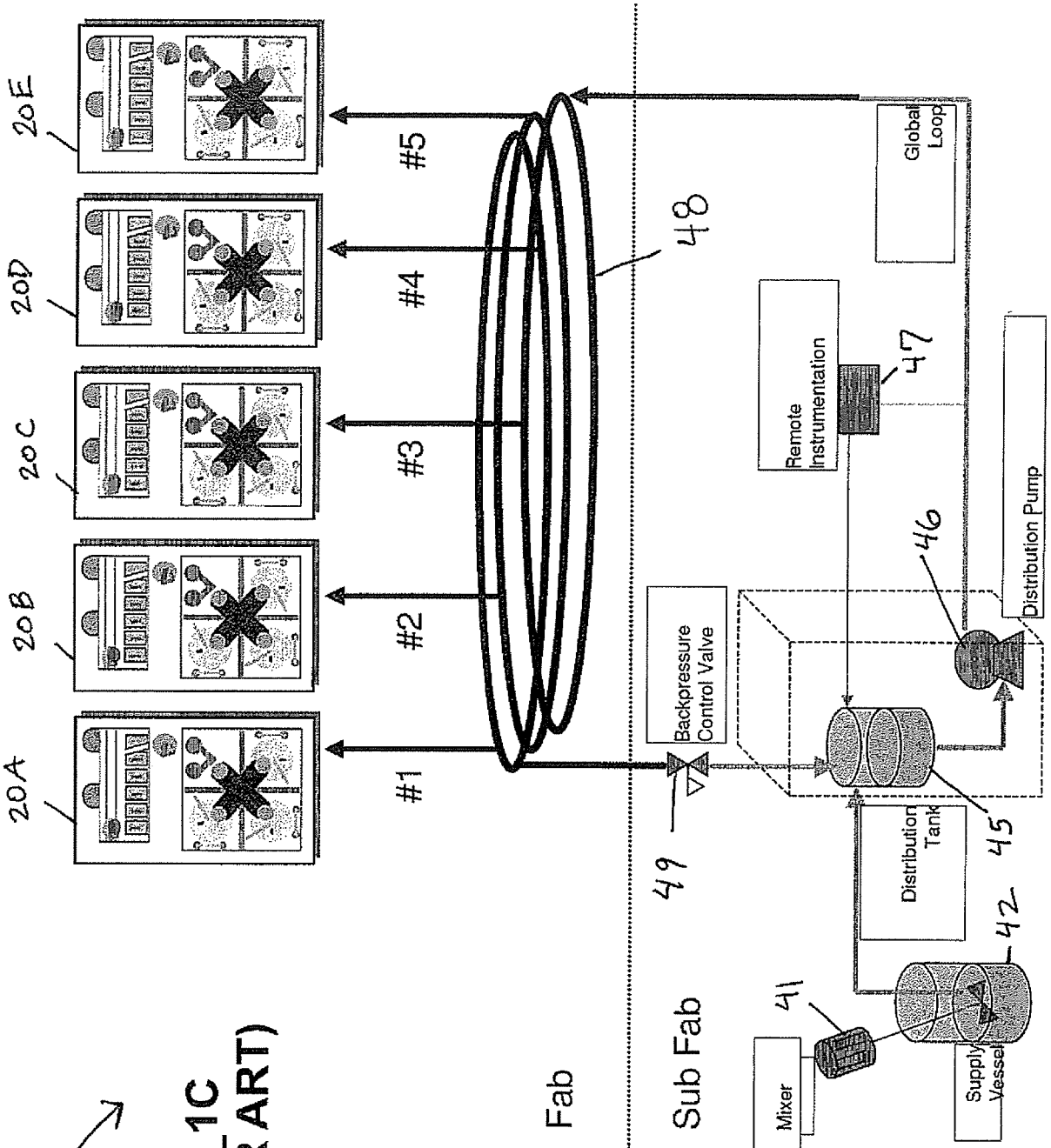


FIG_1C
(PRIOR ART)

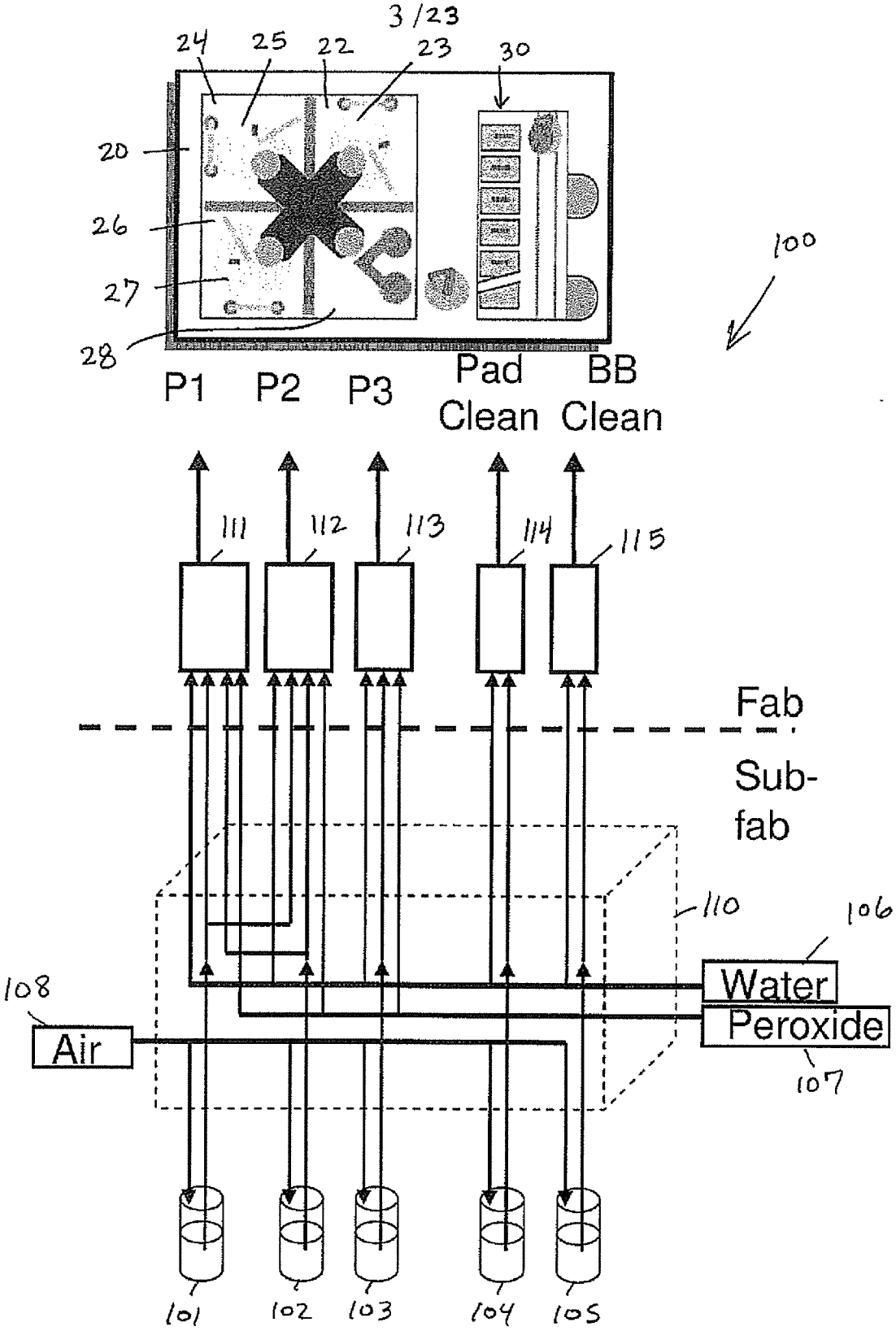

3/23
24
25
22
23
30
20
26
27
28
100
P1
P2
P3
Pad Clean
BB Clean
111
112
113
114
115
Fab
Sub-fab
110
106
Water
Peroxide
107
108
Air
101
102
103
104
105

FIG._2

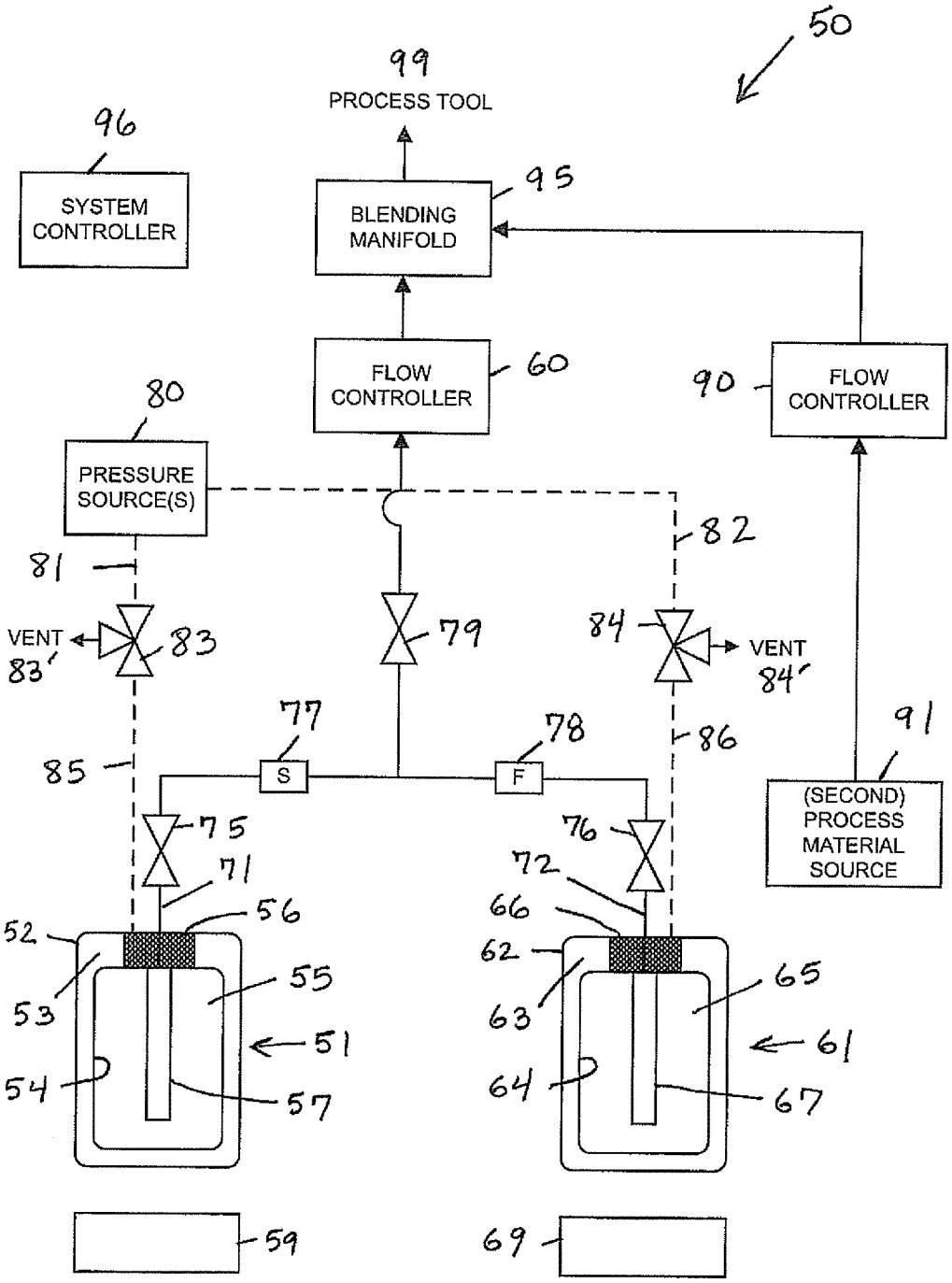

50
99
PROCESS TOOL
96
SYSTEM CONTROLLER
95
BLENDING MANIFOLD
FLOW CONTROLLER
60
90
FLOW CONTROLLER
80
PRESSURE SOURCE(S)
82
81
VENT
83'
83
79
84
VENT
84'
77
78
91
85
S
F
86
(SECOND) PROCESS MATERIAL SOURCE
75
76
71
72
56
66
52
62
53
55
65
63
51
61
54
64
57
67
59
69

FIG._3

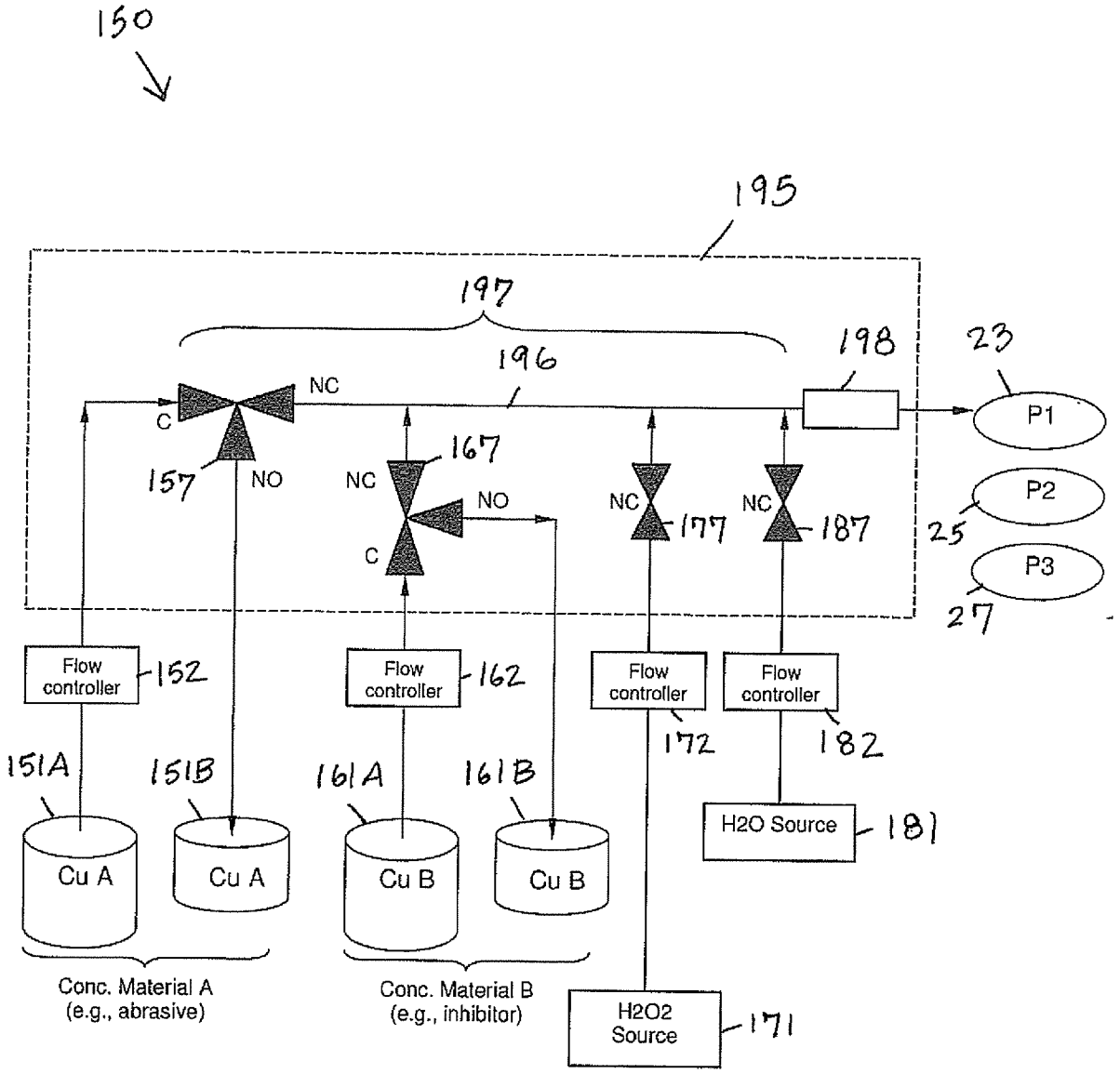

150
195
197
198
23
196
NC
C
157
NO
167
NC
NO
C
NC
177
NC
187
P1
P2
25
P3
27
Flow controller
152
Flow controller
162
Flow controller
172
Flow controller
182
151A
151B
161A
161B
H2O Source
181
Cu A
Cu A
Cu B
Cu B
Conc. Material A
(e.g., abrasive)
Conc. Material B
(e.g., inhibitor)
H2O2 Source
171

FIG._4

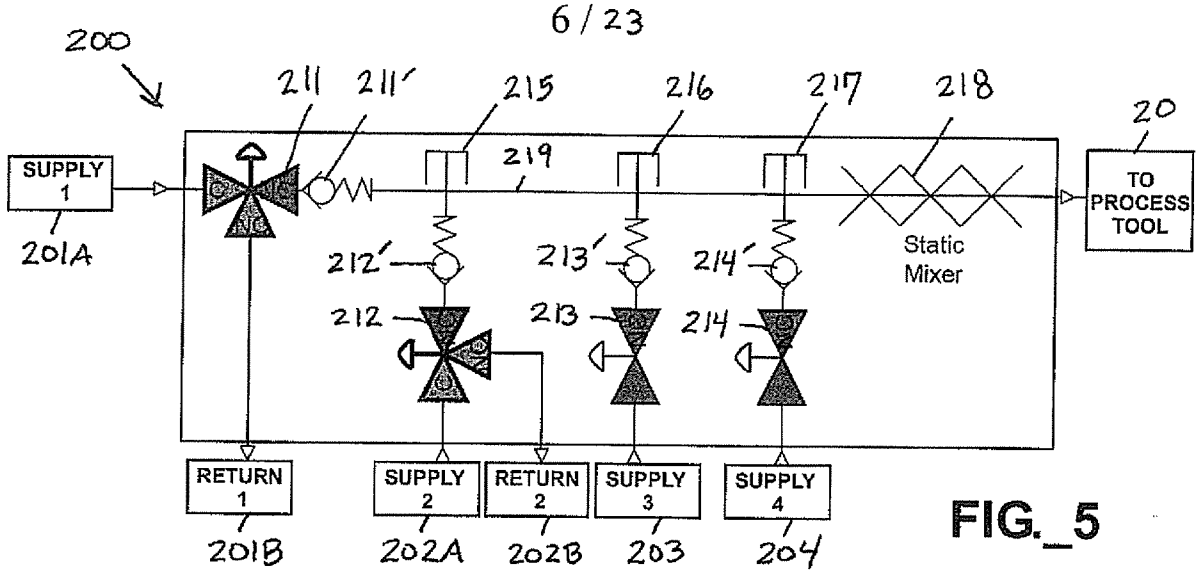


FIG._5

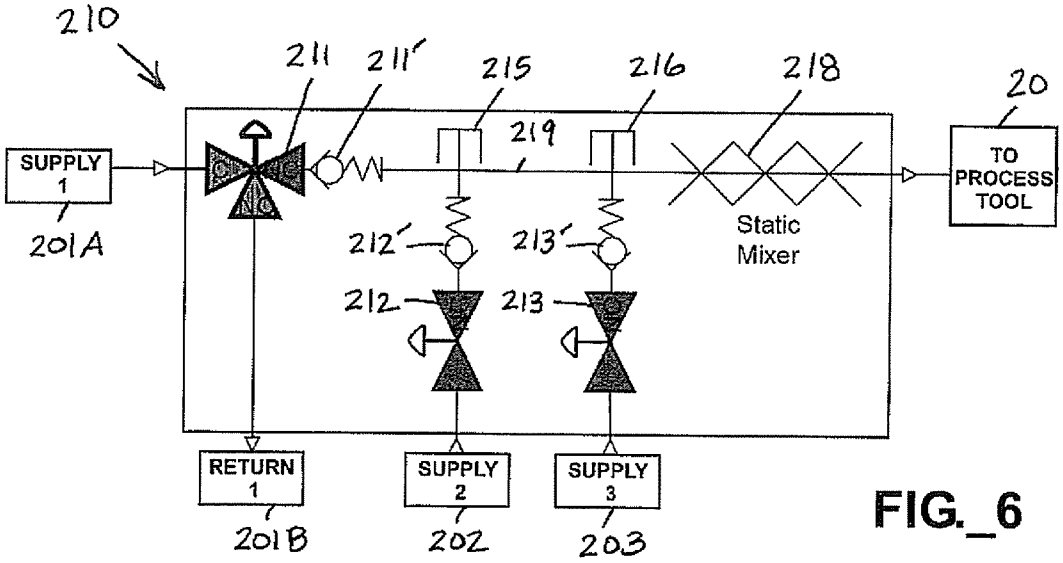


FIG._6

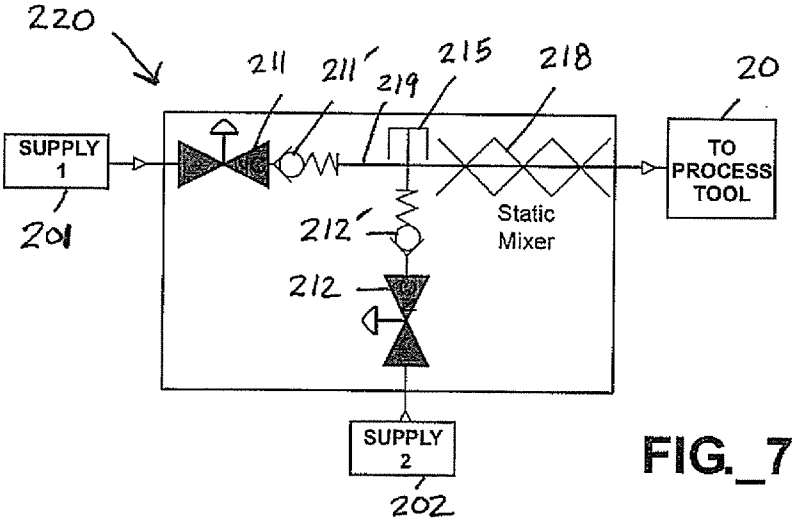


FIG._7

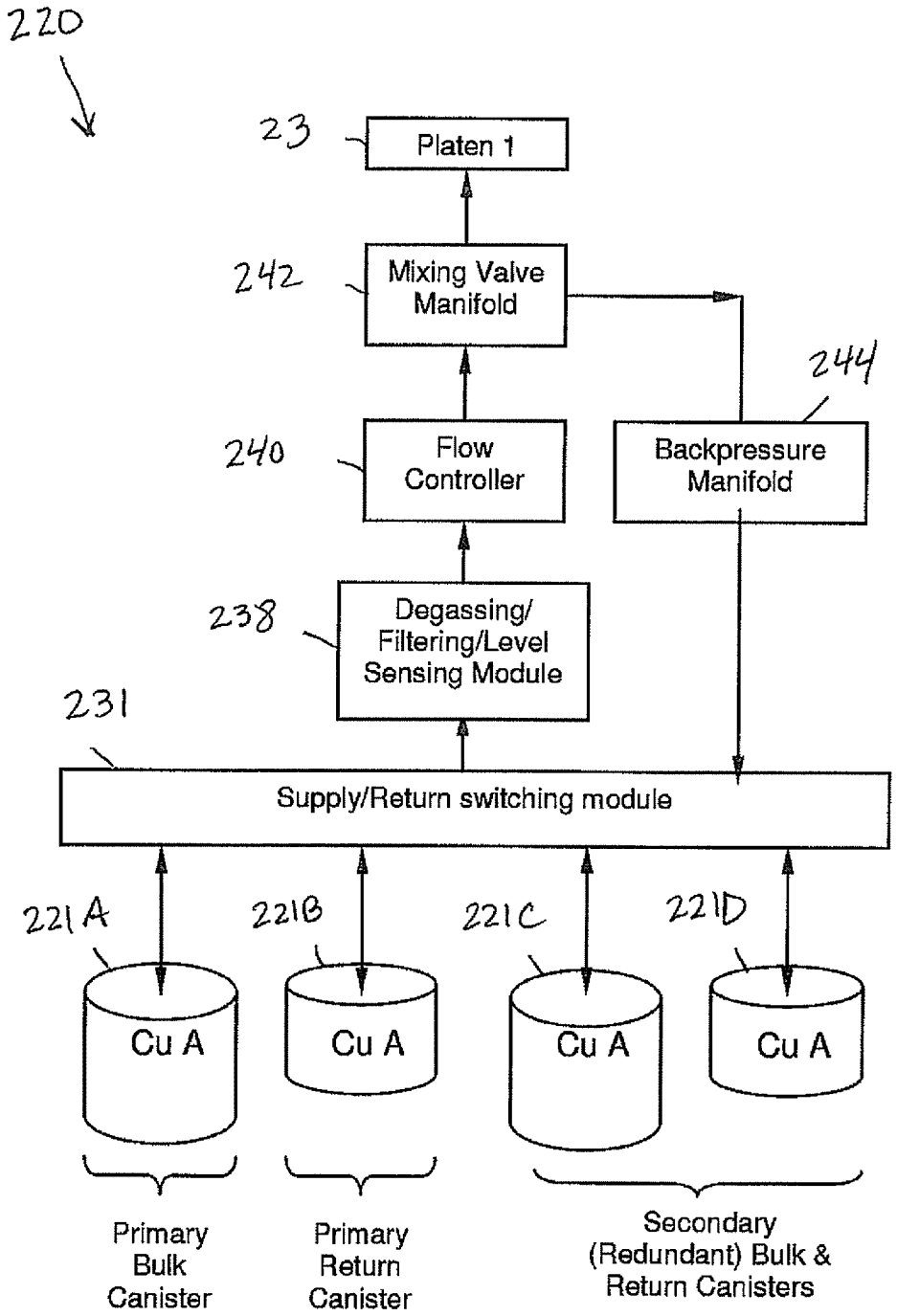

220
23
Platen 1
242
Mixing Valve Manifold
244
240
Flow Controller
Backpressure Manifold
238
Degassing/ Filtering/Level Sensing Module
231
Supply/Return switching module
221A
221B
221C
221D
Cu A
Cu A
Cu A
Cu A
Primary Bulk Canister
Primary Return Canister
Secondary (Redundant) Bulk & Return Canisters

FIG._8

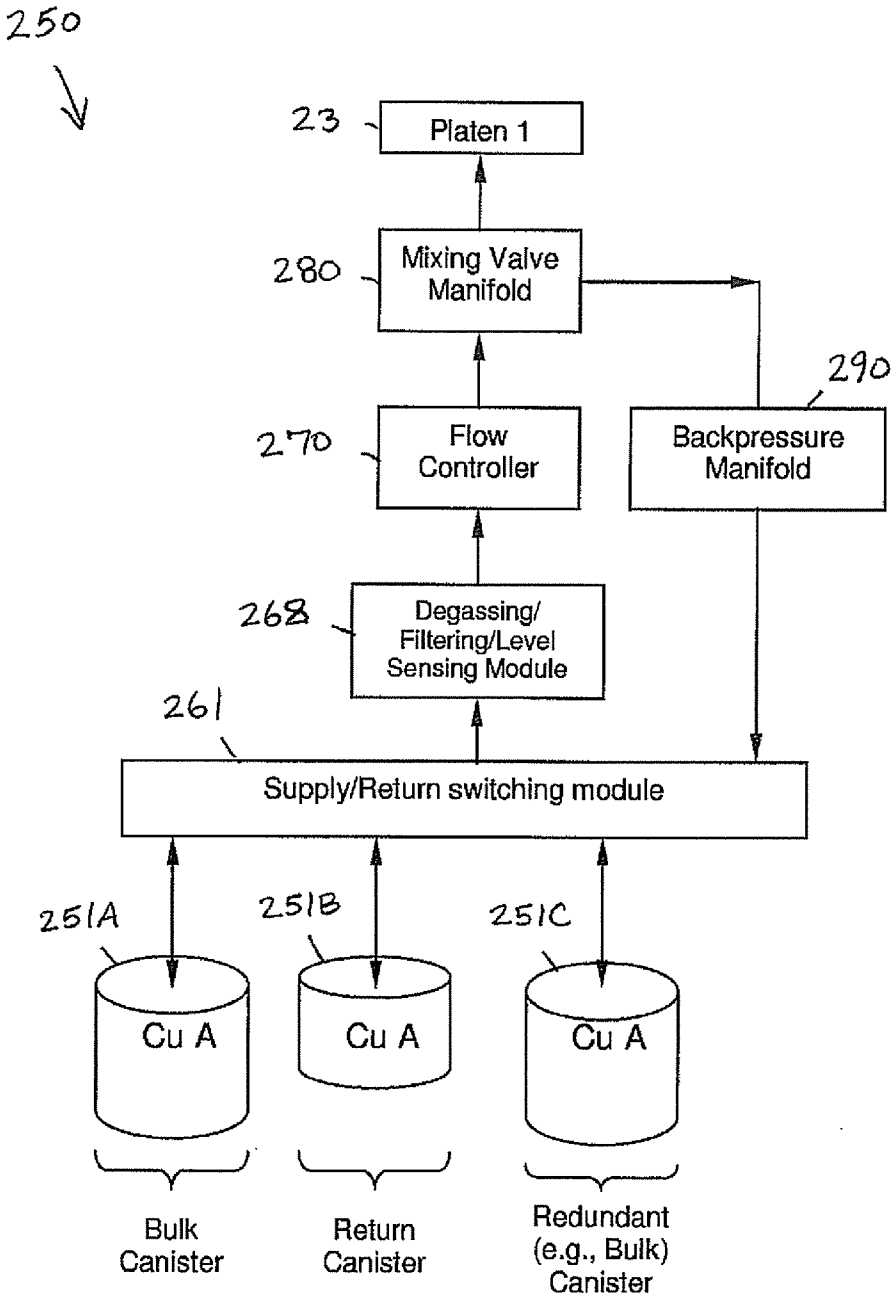

250
23
Platen 1
280
Mixing Valve Manifold
290
270
Flow Controller
Backpressure Manifold
268
Degassing/ Filtering/Level Sensing Module
261
Supply/Return switching module
251A
251B
251C
Cu A
Cu A
Cu A
Bulk Canister
Return Canister
Redundant (e.g., Bulk) Canister

FIG._9

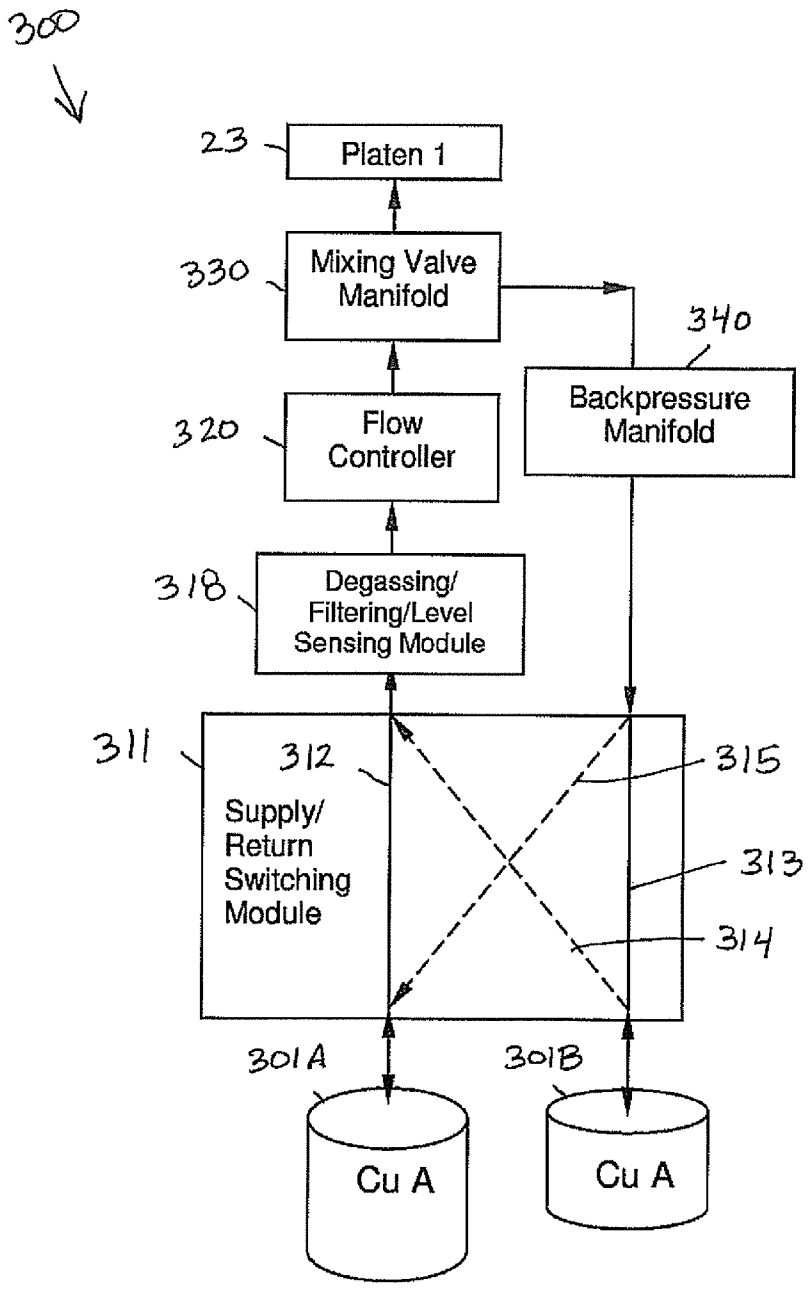

300
23
Platen 1
330
Mixing Valve Manifold
340
Backpressure Manifold
320
Flow Controller
318
Degassing/ Filtering/Level Sensing Module
311
312
Supply/ Return Switching Module
315
313
314
301A
301B
Cu A
Cu A

FIG._10

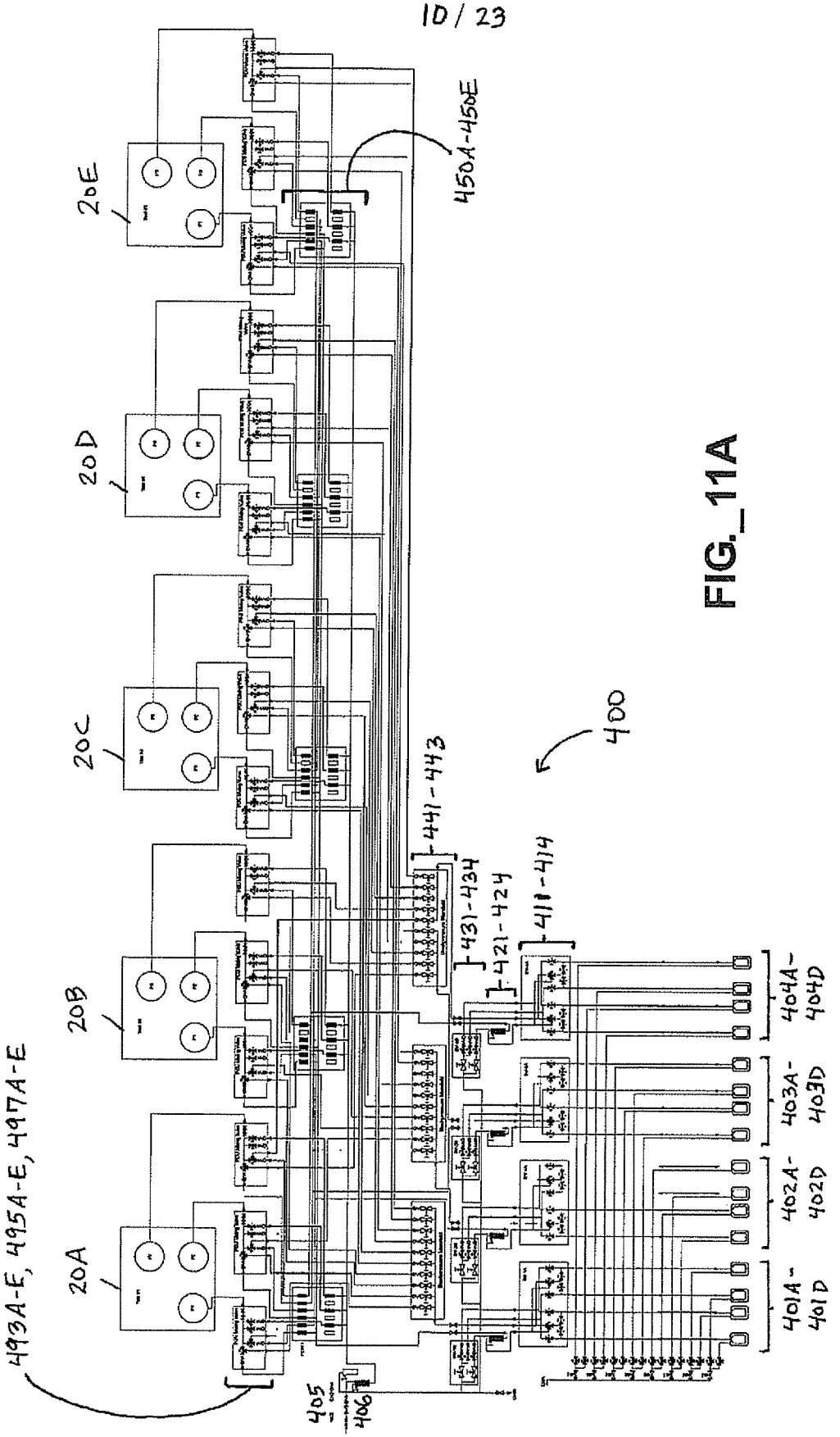

20E
20D
20C
20B
20A
450A-450E
441-443
431-434
421-424
411-414
400
493A-E, 495A-E, 497A-E
405
406
401A-401D
402A-402D
403A-403D
404A-404D

FIG. 11A

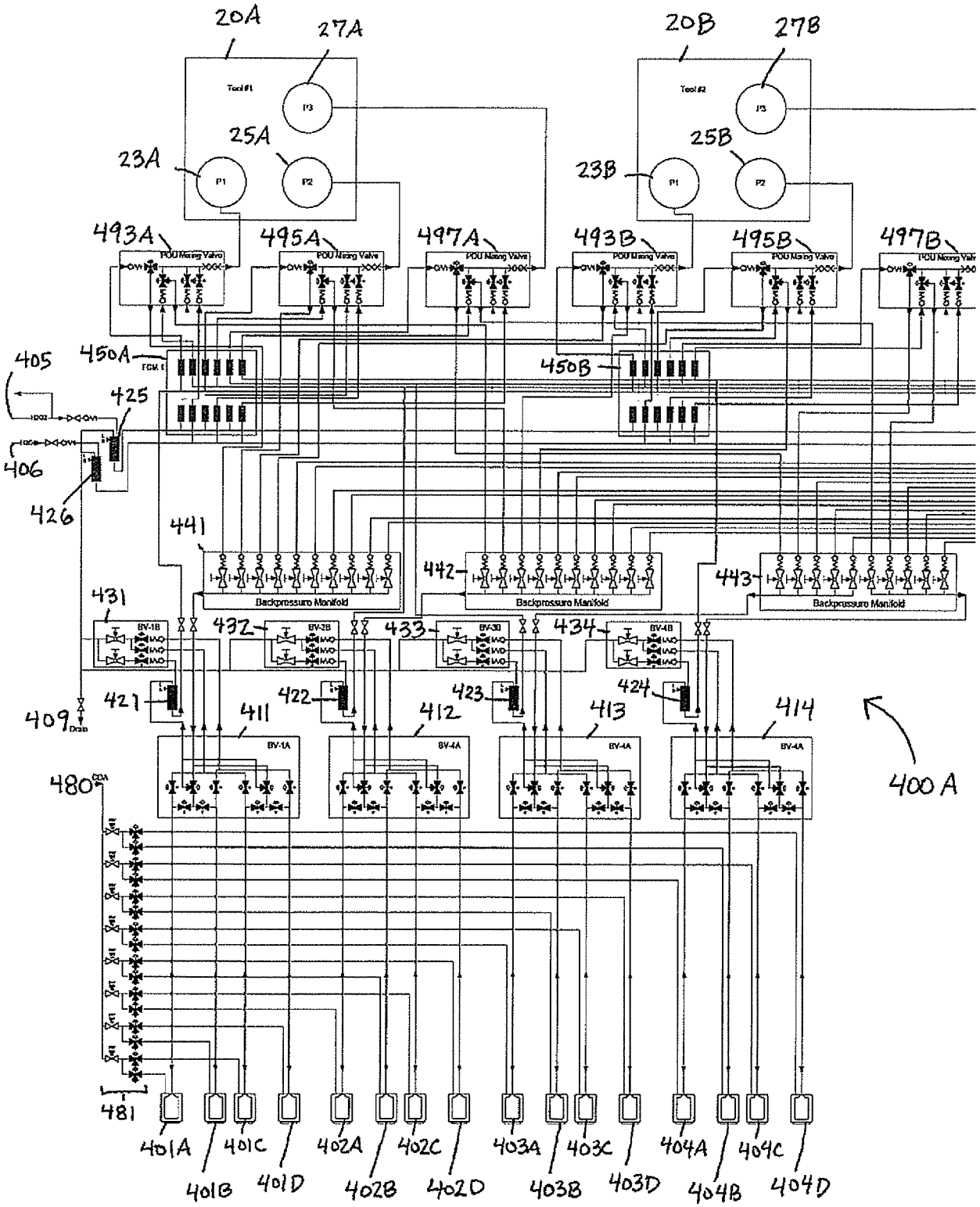

20A
27A
20B
27B
25A
23A
25B
23B
493A
495A
497A
493B
495B
497B
405
450A
450B
425
406
426
441
442
443
Backpressure Manifold
431
432
433
434
421
422
423
424
409
411
412
413
414
400A
480
481
401A
401B
401C
401D
402A
402B
402C
402D
403A
403B
403C
403D
404A
404B
404C
404D

FIG._11B

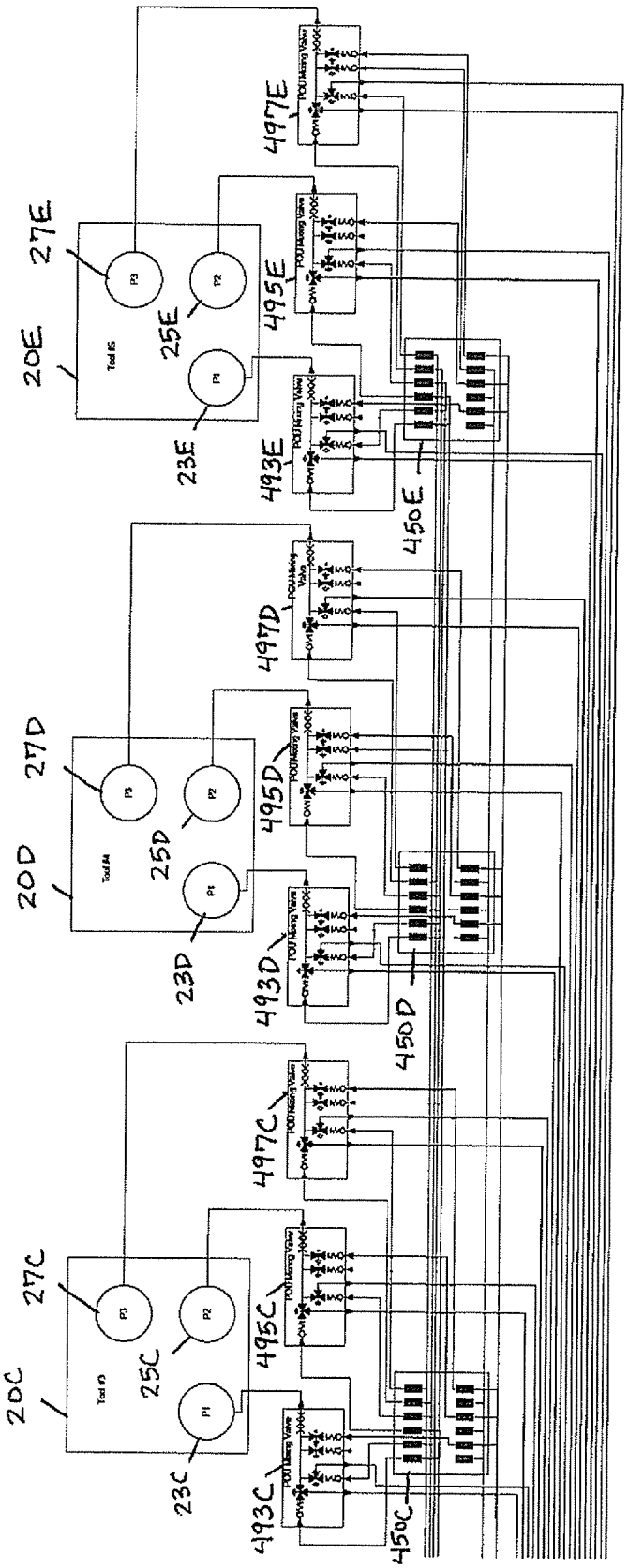

20C
27C
25C
23C
493C
495C
497C
450C
20D
27D
25D
23D
493D
495D
497D
450D
20E
27E
25E
23E
493E
495E
497E
450E
400B

FIG._11C

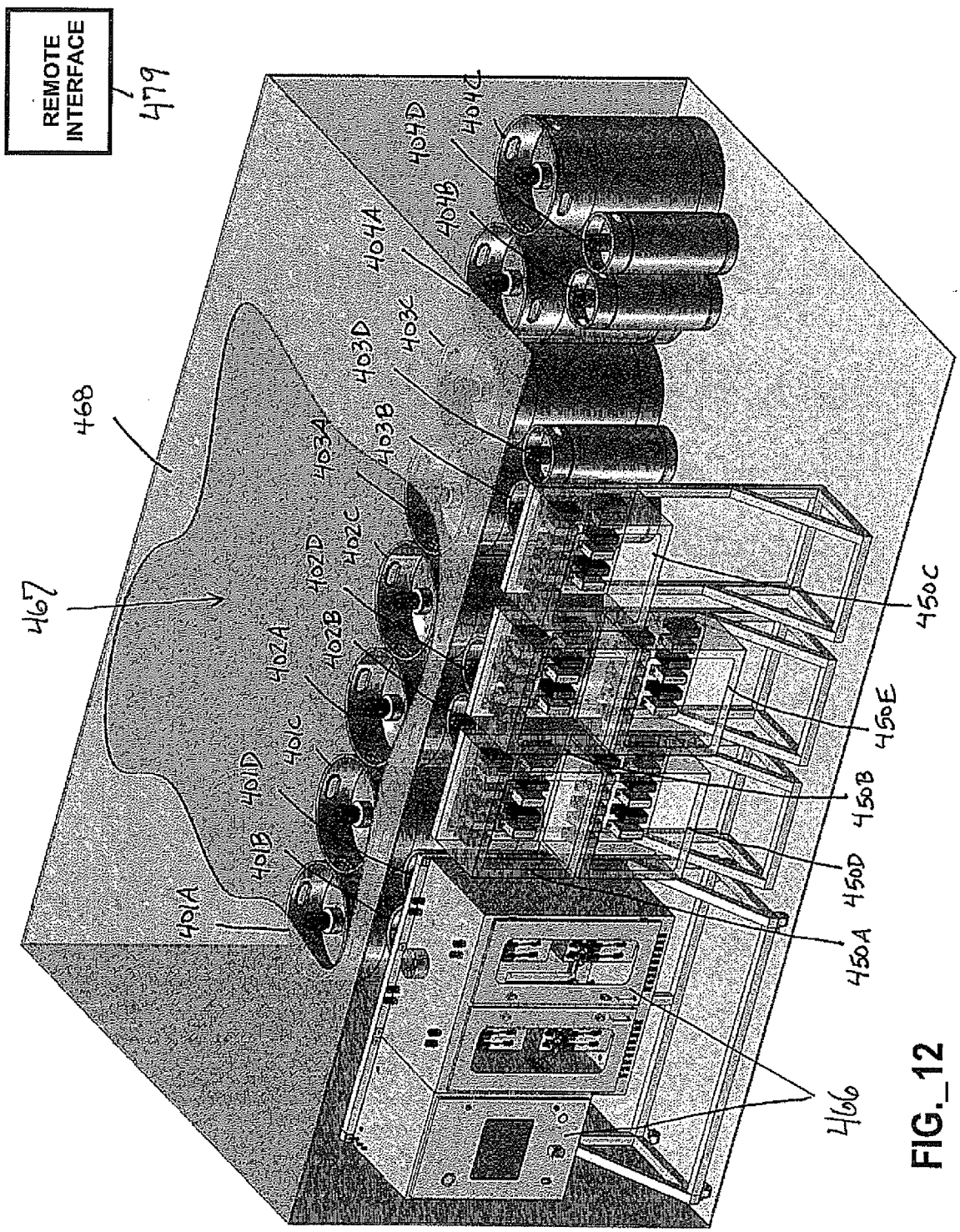

REMOTE INTERFACE
479
468
467
401A
401B
401D
401C
402A
402B
402D
402C
403A
403B
403D
403C
404A
404B
404D
404C
450C
450E
450B
450D
450A
466

FIG._12

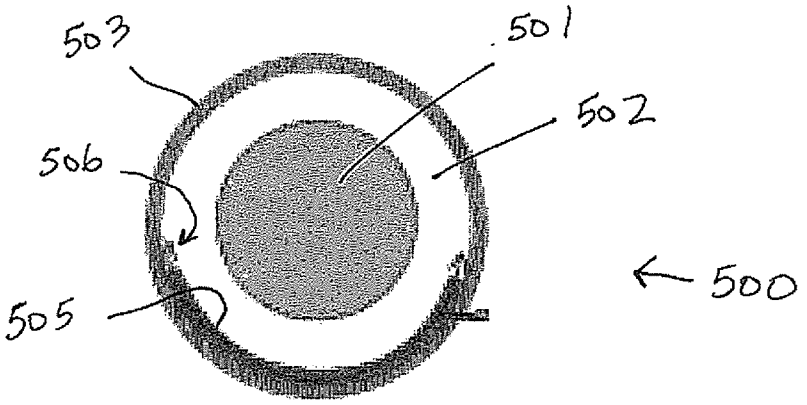


FIG._13A

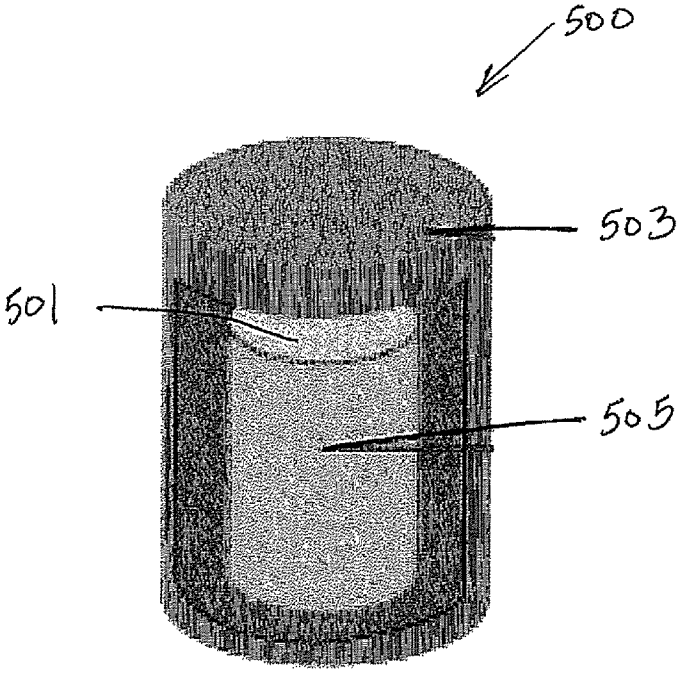


FIG._13B

Station	Conventional Process	CMPlicity Hybrid Process
P1	P1 pre-blended CMP composition	**P1 Early Process:** - Produce and deliver VUL for 35s (e.g., VUL at 10,000 A / min for 35 s, versus VAZ ~ 6,000 A / min for 60 s) • 5 pts V1-UL 3.6X + 10 pts DIW + 3 pts H_2O_2 yields VUL • Flow rates: 83 ml/min + 167 ml/min + 50 ml/min • Total flow rate: 300 ml/min - Process characteristics: fast, high planarization efficiency
		P1 Late process: - Produce and deliver VAZ for < 25s • 5 pts V1-UL 3.6X + 10 pts DIW + 3 pts H_2O_2 + 2 pts AZ 10X yields ~VAZ undiluted • Flow rates: 83 ml/min + 167 ml/min + 50 ml/min + 33 ml/min • Total flow rate: 333 ml/min - Process characteristics: slow, low defectivity, low dishing rate
P2	P2 pre-blended CMP composition	**P2 Process:** - Produce and deliver VAZ for up to 60s - Follows the late P1 process
P3	P3 Barrier composition	**P3 Process:** - No change - Lower buff requirement due to improved P1 and P2 processes

FIG._14

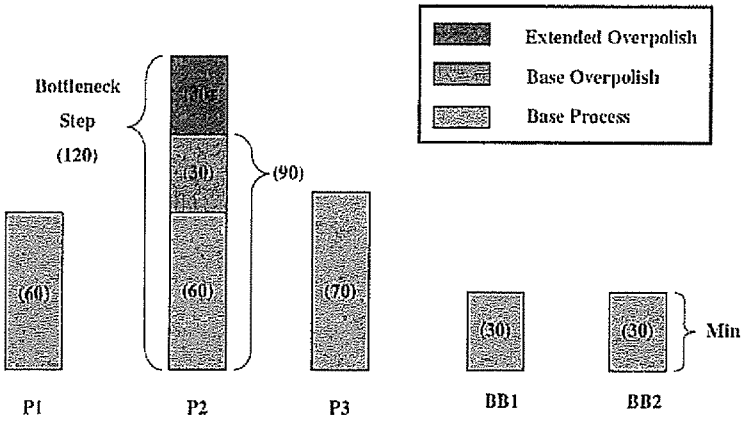


FIG._15

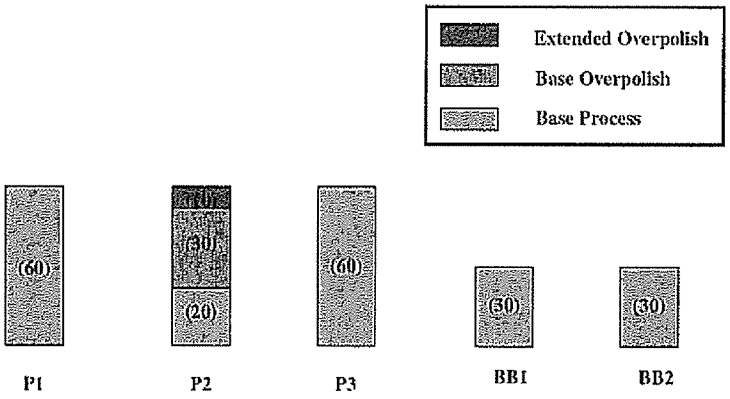


FIG._16

Process Comments	Platen 1			Platen 2 (VAZ)			Dishing (A)		
	VUL time (s)	VAZ time (s)	**Total time (s)**	EP time (s)	Overpolish time (s)	**Total time (s)**	Center	Donut	Edge
Mixed P1 process to increase tool throughput, long P1 time	30	30	**60**	37	20	**57**	279	290	470
As above, but shorter P1 time and longer OP time	30	25	**55**	64	30	**94**	648	528	953
Comparing mixed and regular P1 processes to each other	30	25	**55**	63	20	**83**	421	377	662
	0	55	**55**	118	20	**138**	213	544	799
As above, but longer P1 times	0	60	**60**	114	20	**134**	316	415	842
	30	30	**60**	59	20	**79**	480	296	773
Repeat of row above	30	30	**60**	60	20	**80**	351	433	737
Comparing mixed and regular P1 processes, longer P1 times	30	35	**65**	44	20	**64**	187	206	593
	0	65	**65**	94	20	**114**	225	260	905

FIG._17

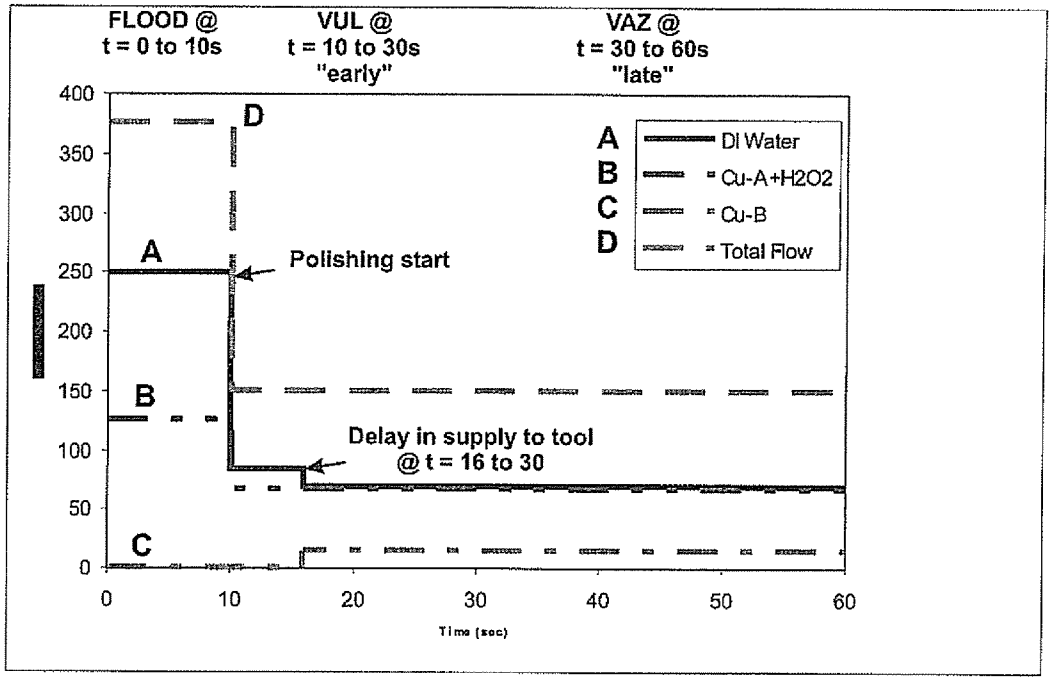


FIG._18A

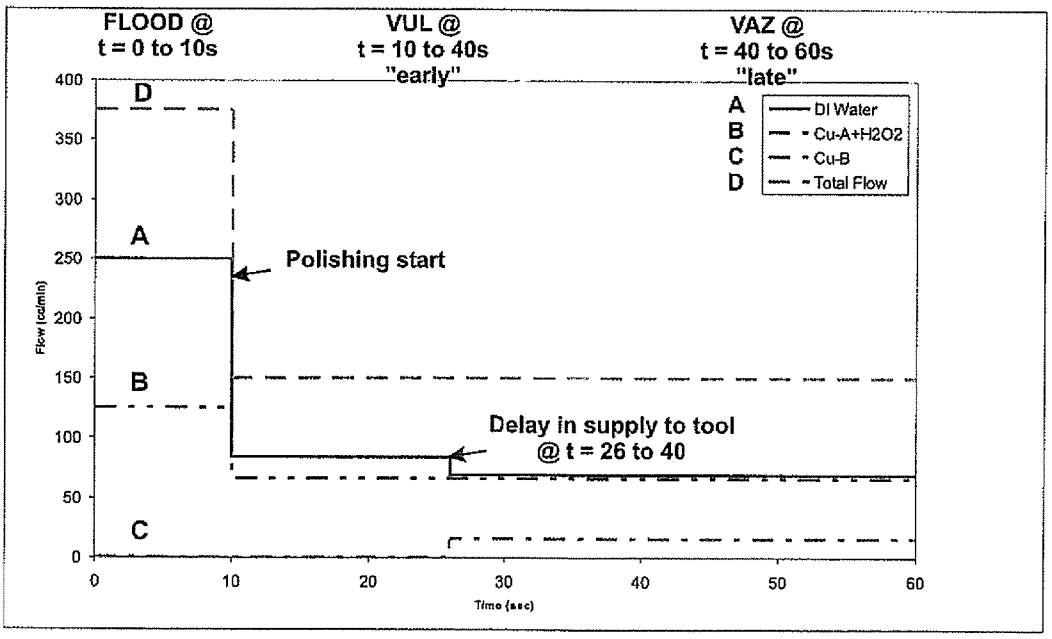


FIG._18B

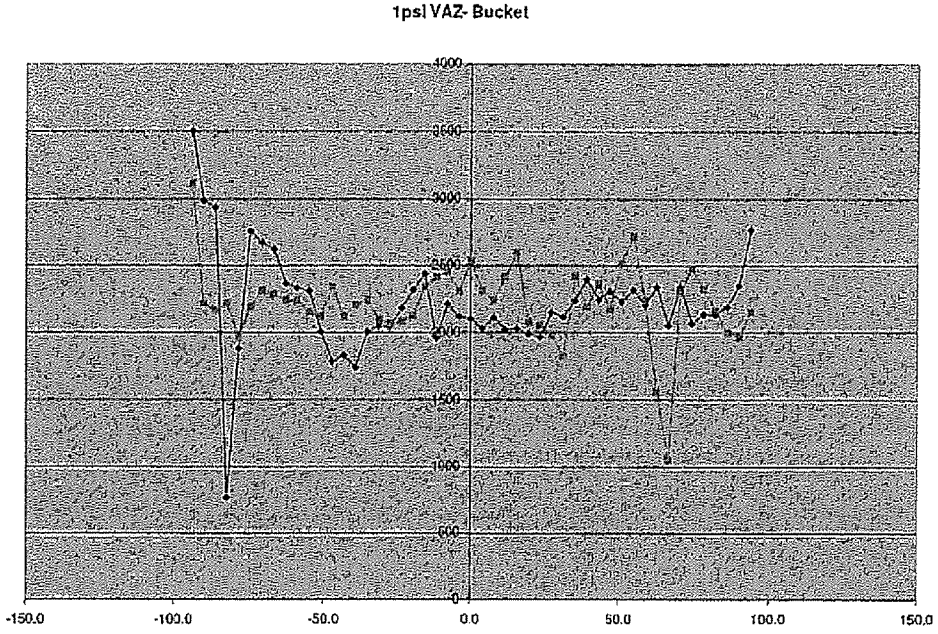


FIG._19A

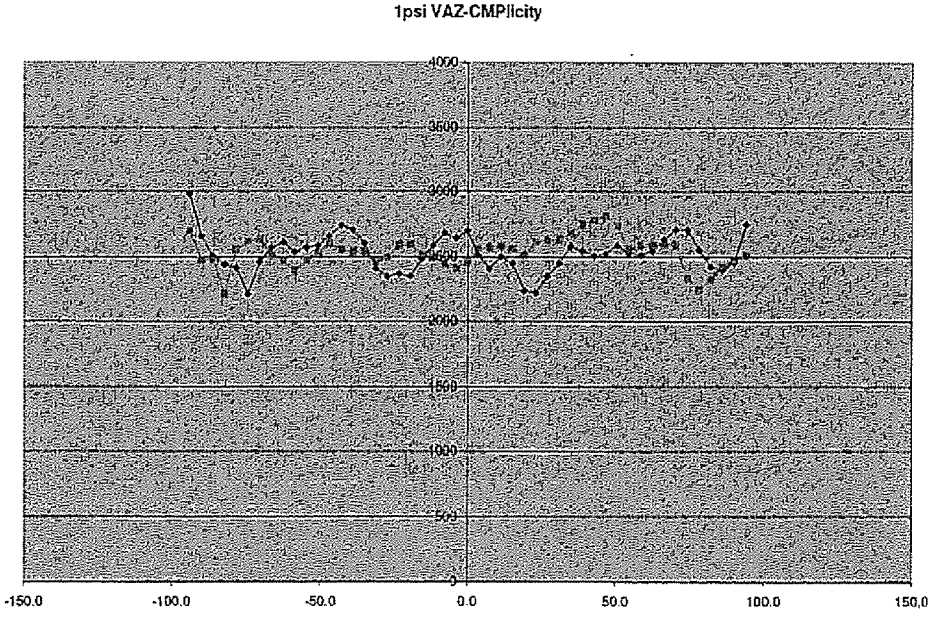


FIG._19B

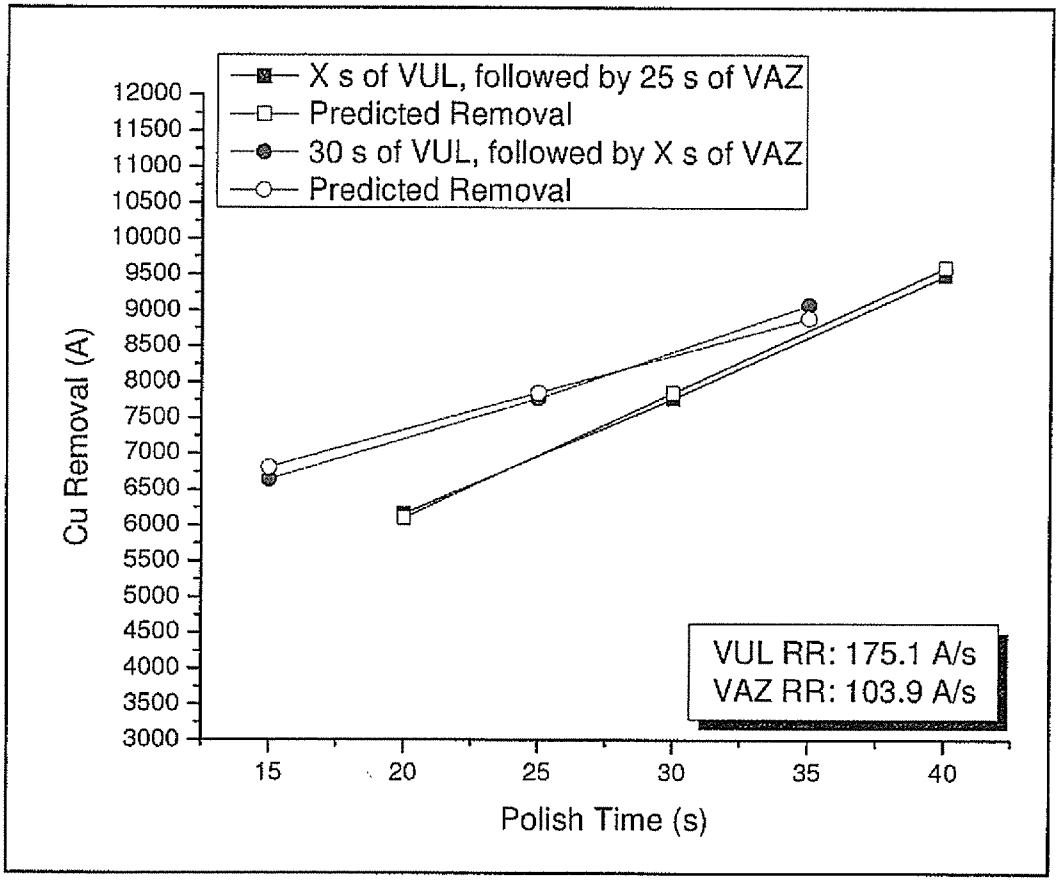

X s of VUL, followed by 25 s of VAZ
Predicted Removal
30 s of VUL, followed by X s of VAZ
Predicted Removal
Cu Removal (A)
12000
11500
11000
10500
10000
9500
9000
8500
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
15
20
25
30
35
40
Polish Time (s)
VUL RR: 175.1 A/s
VAZ RR: 103.9 A/s

FIG._20

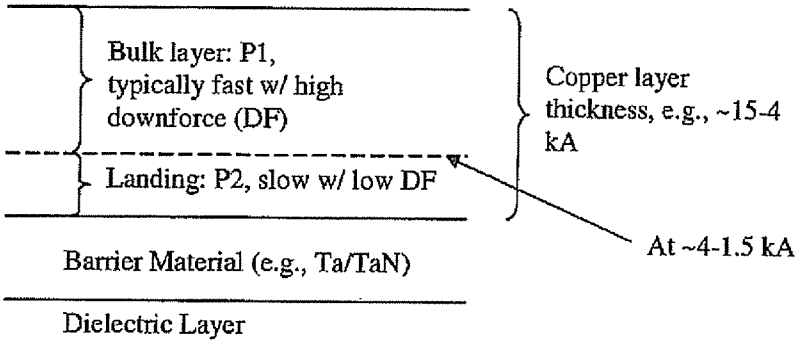


FIG._2/A

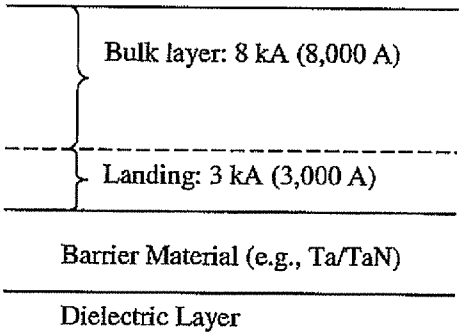


FIG._2/B

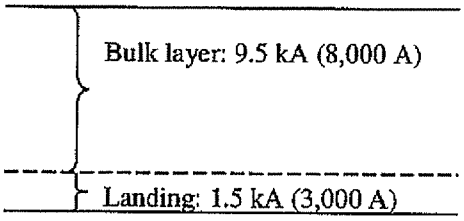


FIG._2/C

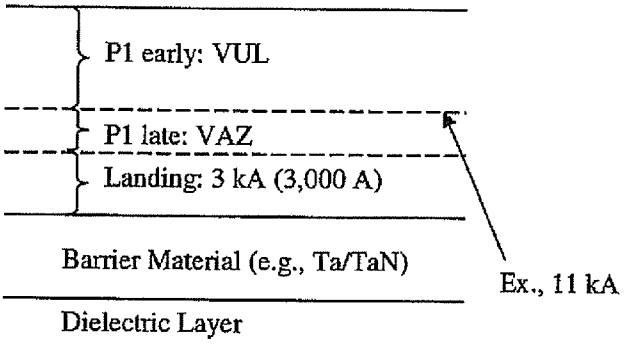


FIG._2/D

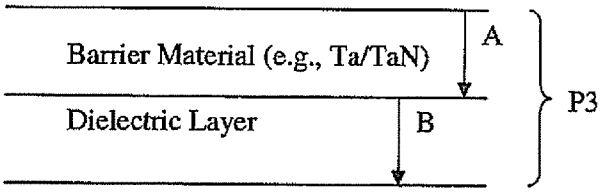


FIG._2/E

100 ml/min -
0<t<60 sec.

50 ml/min -
61<t<90 sec.

0 ml/min -
91<t<120
sec.



FIG._22A



0 ml/min -
0<t<60 sec.

50 ml/min -
61<t<90 sec.

100 ml/min -
91<t<120
sec.

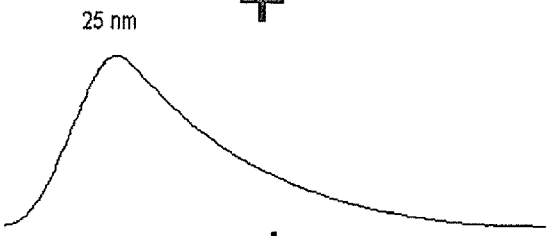




FIG._22B

0 ml/min -
0<t<60 sec.

50 ml/min -
61<t<90 sec.

0 ml/min -
91<t<120
sec.

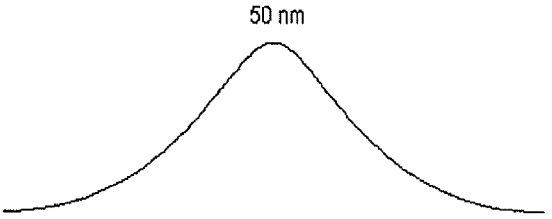




FIG._22C

61<t<90 sec.

A - 50 ml/min
B - 50 ml/min
C - 50 ml/min
Total - 150 ml/min

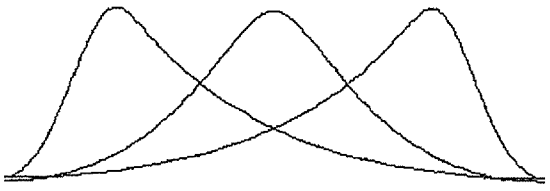


FIG._22D

	Standard VAZ, undil
	Concentration (wt.%)
DI Water	remainder
Chelator	3.0
Inhibitor	0.4
Pol 2 / PVP	0.2
Abrasive	1.0
Pol 1 / SEA	0.1
H2O2	5.0

FIG._23A

	VAZ-X, 4.3 dil, 4% H2O2	VAZ-D, 4.33 dil @ 2.8% H2O2	VAZ-C @ 2.3% H2O2
	Concentrations (wt.%)	Concentrations (wt.%)	Concentrations (wt.%)
DI Water	remainder	remainder	remainder
Chelator	0.70	0.74	2
Inhibitor	0.09	0.11	0.5
Pol 2 / PVP	0.05	0.01	0.15
Abrasive	0.23	0.28	0.5
Pol 1 / SEA	0.05	0.028	0.02
H2O2	3.96	2.8	2.3

FIG._23B

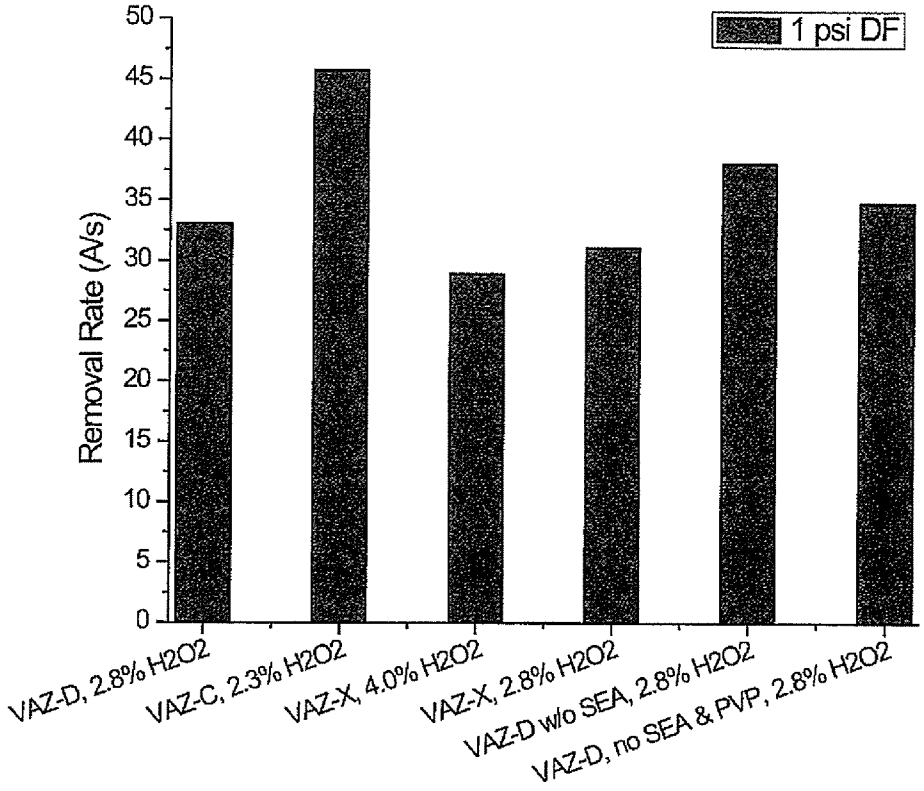

1 psi DF
Removal Rate (A/s)
0
5
10
15
20
25
30
35
40
45
50
VAZ-D, 2.8% H2O2
VAZ-C, 2.3% H2O2
VAZ-X, 4.0% H2O2
VAZ-X, 2.8% H2O2
VAZ-D w/o SEA, 2.8% H2O2
VAZ-D, no SEA & PVP, 2.8% H2O2

FIG._24